8. REGULATIONS AND ADVISORIES

The international, national, and state regulations and guidelines regarding stable cesium in air, water, and other media are summarized in Table 8-1. The regulations regarding radioactive cesium are summarized in Table 8-2.

No MRLs were derived for inhalation or oral exposure to stable or radioactive cesium. Two MRLs, derived by ATSDR (1999) for external exposure to ionizing radiation, are applicable to external exposure to radioisotopes of cesium. An MRL of 400 mrem (4.0 mSv) was derived for acute-duration external exposure (14 days or less), based on cognitive learning deficit in children who had been exposed to ionizing radiation at critical stages of fetal development (gestation weeks 8–15) during the atomic bombing of Hiroshima and Nagasaki (Schull et al. 1988). An MRL of 100 mrem/year (1.0 mSv/year) above background was derived for chronic-duration external exposure (365 days or more), based on the BEIR V (1990) report that the average annual effective ionizing radiation dose to the U.S. population is 360 mrem/year (3.6 mSv/year), a dose not expected to produce adverse health effects.

The EPA has not classified cesium for human carcinogenicity, nor has the EPA derived reference concentrations (RfCs) or reference doses (RfDs) for stable or radioactive cesium (IRIS 2000).

Table 8-1. Regulations and Guidelines Applicable to Cesium

Agency	Description	Information	Reference
INTERNATIONAL Guidelines:			
IARC		ND	IARC 2000
NATIONAL Regulations and Guidelines:			
a. Air:			
ACGIH	TWA–Cesium hydroxide based on upper respiratory tract and eye irritation	2 mg/m^3	ACGIH 2000
NIOSH	REL: TWA–Cesium hydroxide based on eye irritation	2 mg/m^3	NIOSH 2000
OSHA		ND	
EPA		ND	
b. Water		ND	
c. Food		ND	
d. Other		ND	
STATE		ND	

ACGIH = American Conference of Governmental Industrial Hygienists; EPA = Environmental Protection Agency; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; OSHA = Occupational Safety and Health Administration; TWA = time weighted average

Table 8-2. Regulations and Guidelines Applicable to Radioactive Cesium

Agency	Description	Information	Reference
INTERNATIONAL Guidelines:			
IARC		ND	IARC 2000
NATIONAL Regulations and Guidelines:			
a. Air:			
ACGIH		ND	ACGIH 2000
EPA	Detection limits for man-made beta particle and photon emitters	10 pCi/L	EPA 1999a 40 CFR 141.25
NIOSH		ND	NIOSH 2000
NRC	Effluent concentrations—air		NRC 1999
	Cesium 134	$2x10^{-10}$ µCi/mL	10 CFR 20 App B
	Cesium 137	$2x10^{-10}$ µCi/mL	
b. Water			
NRC	Effluent concentrations—water		NRC 1999
	Cesium 134	$9x10^{-7}$ µCi/ml	10 CFR 20 App B
	Cesium 137	$1x10^{-6}$ µCi/ml	
c. Food		ND	
d. other			
EPA	Concentration levels for environmental compliance—		EPA 1999 40 CFR 61 App E
	Cesium 134	$2.7x10^{-14}$ Ci/m^3	
	Cesium 137	$1.9x10^{-14}$ Ci/m^3	
	Carcinogenicity—slope factors[a]		EPA 1997b
	Lifetime risk per pCi—ingestion		
	Cesium 131	$1.80x10^{-13}$	
	Cesium 134	$4.73x10^{-11}$	
	Cesium 134 meta stable	$4.54x10^{-14}$	
	Cesium 135	$4.53x10^{-12}$	
	Cesium 136	$7.74x10^{-12}$	
	Cesium 137	$3.16x10^{-11}$	
	Cesium 137 plus disintegration products	$3.16x10^{-11}$	
	Cesium 138	$1.76x10^{-13}$	

Table 8-2. Regulations and Guidelines Applicable to Radioactive Cesium *(continued)*

Agency	Description	Information	Reference
NATIONAL (*cont.*)			
EPA (*cont.*)	Lifetime risk per pCi—inhalation		EPA 1997b
	Cesium 131	1.06×10^{-13}	
	Cesium 134	2.89×10^{-11}	
	Cesium 134 meta stable	3.10×10^{-14}	
	Cesium 135	2.71×10^{-12}	
	Cesium 136	4.65×10^{-12}	
	Cesium 137	1.91×10^{-11}	
	Cesium 137 plus disintegration products	1.91×10^{-11}	
	Cesium 138	1.30×10^{-13}	
	External exposure—risk/year per pCi/g soil		
	Cesium 131	2.34×10^{-9}	
	Cesium 134	5.88×10^{-6}	
	Cesium 134 meta stable	1.96×10^{-8}	
	Cesium 135	0	
	Cesium 136	8.13×10^{-6}	
	Cesium 137	0	
	Cesium 137 plus disintegration products	2.09×10^{-6}	
	Cesium 138	9.45×10^{-6}	
NRC	Occupational inhalation exposure		NRC 1999 10 CFR 20 App B
		100 µCi	
	ALIs	200 µCi	
	Cesium 134		
	Cesium 137	4×10^{-8} µCi/mL	
		6×10^{-8} µCi/mL	
	DACs		
	Cesium 134		
	Cesium 137		
	Quantities of licensed material requiring labeling—		NRC 1999 10 CFR App C
	Cesium 134	10 µCi	
	Cesium 137	10 µCi	
STATE			
A. Air			
Michigan	Gross beta particle activity—Cesium 134	15 pCi/L	MI Dept Environ Quality 2000
b. Water		ND	

Table 8-2. Regulations and Guidelines Applicable to Radioactive Cesium *(continued)*

Agency	Description	Information	Reference
STATE *(cont.)*			
c. Other			
Louisiana	Quantity required for consideration of need for emergency plan for responding to a release:		LA Dept Environ Quality 2000
	Cesium 134		
	Release fraction	0.01	
	Quantity	2,000 Ci	
	Cesium 137		
	Release fraction	0.01	
	Quantity	3,000 Ci	

[a]Radionuclide slope factors are calculated by EPA's Office of Radiation and Indoor Air (ORIA) to assist HEAST users with risk-related evaluations and decision-making at various stages of the remediation process. Ingestion and inhalation slope factors are central estimates in a linear model of the age-averaged, lifetime attributable radiation cancer incidence (fatal and nonfatal cancer) risk per unit of activity inhaled or ingested, expressed as risk/picocurie (pCi). External exposure slope factors are central estimates of the lifetime attributable radiation cancer incidence risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil, and are expressed as risk/year per pCi/gram of soil.

ACGIH = American Conference of Governmental Industrial Hygienists; ALI = annual limitations on intake; CFR = Code of Federal Regulations; DAC = derived air concentrations; EPA = Environmental Protection Agency; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NRC = Nuclear Regulatory Commission; OSHA = Occupational Safety and Health Administration